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ABSTRACT

This guide gives specific guidelines for a five-step system to install effectively an individualized mathematics program. These steps are: (1) use of a planning model described; (2) organization of resources available; (3) installation of an environment in which individualization is possible; (4) use of diagnostic and prescriptive teaching; and (5) installation of student-directed teaching and learning strategies including all aspects of learner decision-making. (MP)

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TEACHING FOR MASTERY

IN MATHEMATICS

JAN 4 10 20 AM '79

USING THE U-SAIL BASIC MATHEMATICS SYSTEM

SE 026 879

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AN INDIVIDUALIZED SYSTEM FOR INSTRUCTION IN MATHEMATICS

The Utah System Approach to Individualized Learning Project was funded in July of 1970 through a United States Office of Education Title III grant. It has continued by State and local funding.

The project is a multi-district/state consortium effort. Davis, Granite, Iron, Jordan, Murray, Salt Lake and Tooele districts have been involved since its inception.

Project policy and management is under the direction of Superintendents John Reed Call, Clarke N. Johnsen, J. Clair Morris, Glen C. Oldroyd, Walter D. Talbot, M. Donald Thomas, Bernell Wrigley Donald J. Parr, Chairman, Carma M. Hales, Director

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1976

INTRODUCTION

Instruction of students in basic mathematics is a universal teaching responsibility. Making the effort spent most productive in terms of time, energy, and outcomes is a constant teacher challenge. The U-SAIL Basic Mathematics System provides teachers with concrete step by step practical assistance in the development of student centered teaching environments in which there is continuous improvement of instruction.

This guide gives, in outline, ready reference form, specific guidelines to effectively plan, organize, and manage for instruction.

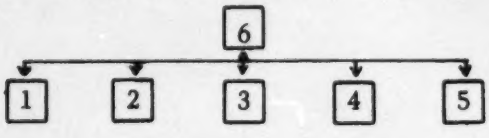
PLANNING

Identify your reasons for teaching mathematics and key these to what you plan to do. These give the purpose for all activity. One goal is student mastery of basic arithmetic. Also included is development of students who know basic arithmetic skills and who effectively use basic arithmetic skills in life application situations. State, district, school, teacher, and student goals give purpose to your instruction.

Use of the U-SAIL planning model can help you to keep your goals in mind and bridge the gap between what ought to be and what is happening each day in the classroom.

This open-system model was designed to give the specific steps to be followed in planning, organizing, implementing, and evaluating program installation. Each component in the system is influenced, and influences, every other system component. It follows:

Planning Model for Decision Making



1. Ideal Goals: Establish terminal goals for learners. (e.g. All learners will be able to compute accurately.)

2. Reality Base: Determine options and constraints. (e.g. Students learn at different rates.)

3. Reality Goals: Establish performance objectives. (e.g. Each learner will be placed where he belongs according to concept mastery and grouping structure needed.)

4. Work Base: Complete task analysis. (e.g. Who will do what will be determined.)

5. Work Flow: Project time frames. (e.g. By October 1st, all students will be grouped into at least three instructional groups.)

6. Review, Evaluation, Revision: Consider 1-5 above as data base enlarges. (e.g. The time for grouping is changed to September 21st, because new resources will be made available.)

ORGANIZATION

1. Understand and organize the content to be taught. The structure of the discipline gives you the necessary foundation for instruction.

   a. Identify what is to be taught and an order for teaching it. (This is your scope and sequence.)

   b. Have both your scope and sequence accessible to you at all times. (These guide you in diagnostic and prescriptive decisions made.)

2. On page three, the scope of the U-SAIL Basic Mathematics System is given. You will note that it includes a listing of major concept areas, a simple code to identify each concept area, specific concepts, and identification of levels of difficulty from A-G in which units of work (called pacs in the U-SAIL materials) appear for instruction and review. For example: A/S-10 is an addition and subtraction concept. It is the 10th concept in the addition/subtraction concept area and is introduced at level C, taught again at level D, and reviewed at levels E and F. Note that the pacs within each level are numbered. In this case A/S-10 . . . C 14 means that C 14 is the 14th unit presented in the C level of difficulty. An R at the end of a pac indicates that the pac provides review only.

   On page four, a chart showing a suggested order or sequence for instruction is included. This chart contains an overview of the total contents of the system in an order or sequence. You will note that each pac (unit for instruction) is numbered in the order presented. This will serve as a general "direct route" guide for you as you teach and prescribe.

3. Identify the skill building blocks needed. Once you have a complete picture of what is involved in basic arithmetic instruction you need also to know the building blocks needed to learn each arithmetic skill or concept. To do this, identify each skill required before a student can learn something new. For example, you would never expect a student to successfully work with division before he had mastered basic multiplication facts.

U-SAIL CONCEPTUAL MATHEMATICS SYSTEM

CONCEPT AREA		CONCEPT	A	B	C	D	E	F	G
SETS	SETS-1	description	A2						
	SETS-2	equivalent	A3	B1-R					
	SETS-3	1 more or less member	A4						
	SETS-4	numbers 1-4	A5						
	SETS-5	zero	A6						
	SETS-6	numbers 0-10	A7	B2-R					
	SETS-7	number comparison	A8		C1-R				
	SETS-8	ordering	A9						
	SETS-9	union of sets	A11						
	SETS-10	partitioning of sets	A12						
WHOLE NUMBERS	WN-1	counting	A1						
	WN-2	ordering 0-10	A10	B3-R					
	WN-3	writing numbers		B4					
	WN-4	0-100, ordering, skip counting		B9	C4				
	WN-5	Roman numerals I-XII			C5				
	WN-6	odd or even, skip counting			C15				
	WN-7	number history						G2	
ADDITION AND SUBTRACTION	A/S-1	add, sums thru 5		B5					
	A/S-2	sub., comb. thru 5		B6					
	A/S-3	add, sub., comb. thru 9		B7					
	A/S-4	add, sub., comb. thru 10		B10	C3	D1-R			
	A/S-5	add, sub., comb. thru 18		B12	C6				
	A/S-6	3 addends		B13	C7				
	A/S-7	add, without regrouping			C11	D3	E4-R		
	A/S-8	sub., without regrouping			C12	D5	E5-R		
	A/S-9	add, regrouping			C13	D4	E6-R	F4-R	
	A/S-10	sub., regrouping			C14	D6	E7-R	F5-R	
	A/S-11	rounding numbers				D6	E8-R		
PLACE VALUE	PL V-1	ones & tens		B8	C2				
	PL V-2	ones thru hundreds			C8				
	PL V-3	ones thru thousands			C10				
	PL V-4	ones thru hundred thousands				D7	E9-R		
	PL V-5	ones thru hundred millions					E4	F1-R	
	PL V-6	large magnitude, exponents						F2	G16-R
	PL V-7	bases 4 & 5						F3	
	PL V-8	bases 6 & 8							G3
MEASUREMENT	ME-1	time-hour, half hour		B11					
	ME-2	time-5 minutes			C9				
	ME-3	length-inches		B15					
	ME-4	length-inches, centimeters			C16				
	ME-5	volume-cups, pints, quarts		B16					
	ME-6	volume-gallons			C19				
	ME-7	length, perimeter, area, volume				D11	E13		
	ME-8	money-pennies, nickels, dimes		B14					
	ME-9	metric system						F24	
FRACTIONS	FR-1	fractions-emphasis on 1/2, 1/3, 1/4		B18					
	FR-2	fractions-halves thru fifths			C17				
	FR-3	fractions-halves thru eighths				D12			
	FR-4	fractions-parts of whole					E14		
	FR-5	fractions comparison					E15	F18	G18-R
	FR-6	fractions-improper, mixed numbers					E16		
GEOMETRY	GE-1	shapes		B17	C20-R				
	GE-2	plane figures				D17			
	GE-3	plane figures, congruency, parallel lines						F21	G20-R
	GE-4	circles					E18		
	GE-5	geometric solids					E19		G21-R
	GE-6	angles						F20	G6-R
	GE-7	geometry-area, volume, surface area						F22	G20-R
	GE-8	triangles							G7
	GE-9	circles-circumference, area							G19
MULTIPLICATION AND DIVISION	M/D-1	mult., facts thru 5			C18				
	M/D-2	mult., facts thru 9				D7			
	M/D-3	division, single digits				D8			
	M/D-4	mult., single digit multipliers				D9	E9-R		
	M/D-5	division, 1 digit divisor				D10	E9	F8-R	
	M/D-6	mult., regrouping					E8	F6-R	G5-R
	M/D-7	division, multi-digit divisor					E10	F9-R	G20-R
	M/D-8	averages					E11	F10-R	
	M/D-9	factors, primes, multiples						F12	G5-R
	M/D-10	rounding numbers					E12	F10-R	
GRAPHS AND FUNCTIONS	GR-1	grahs, points and coordinates				D13	E20		
	GR-2	graphing-4 quadrants						F23	
	GR-3	graphing-4 quadrants, functions							G24
FRACTIONS ADDITION AND SUBTRACTION	FR-A/S-1	fractions-add, sub., like denominators					E17	F14-R	
	FR-A/S-2	fractions-add, sub., unlike denominators						F15	G9-R
	FR-A/S-3	fractions-add, sub., mixed numbers						F16	G10-R
FRACTIONS MULT/DIV	FR-M/D-1	fractions-multiplication						F17	G11-R
	FR-M/D-2	fractions-division							G12
DECIMALS	DE-1	decimals						F19	G14-R
	DE-2	rounding decimals							G15
DECIMALS ADD/SUB	DE-A/S-1	decimals-add and sub						F19	G16-R
DECIMALS MULT/DIV	DE-M/D-1	decimals-multiplication							G17
	DE-M/D-2	decimals-division							G18
RATIO AND PROPORTION	RA-1	ratio and proportion							G23
	RA-2	ratio, probability							G25
PERCENT	PER-1	percent							G22
INTEGERS	IN-1	integers-add, sub.							G26

NOTE: Letters A through G refer to approximate grade levels (e.g. A-Kindergarten, G-6th grade). Numbers within the grade level columns refer to a possible order for introducing the concept.

U-SAIL MATH CONCEPTS

Organized In Sequence For Instruction

LEVEL A

Order	Concept
1	WN-1 counting
2	SETS-1 description
3	SETS-2 equivalent
4	SETS-3 1 more or less member
5	SETS-4 numbers 1-4
6	SETS-5 zero
7	SETS-6 numbers 0-10
8	SETS-7 number comparison
9	SETS-8 ordering 0-10
10	WN-2 ordering 0-10
11	SETS-9 union of sets
12	SETS-10 partitioning of sets

LEVEL B

Order	Concept
1-R	SETS-2 equivalent
2-R	SETS-6 numbers 0-10
3	WN-3 writing numbers
4-R	WN-2 ordering 0-10
5	A/S-1 add sums thru 5
6	A/S-2 sub. combs. thru 5
7	A/S-3 add, sub. combs. thru 9
8	PI V-1 ones & tens
9	WN-4 0-100, ordering, skip counting
10	A/S-4 add, sub. combs. thru 10
11	ME-1 time-hour, half hour
12	A/S-5 add, sub. combs. thru 18
13	A/S-6 3 addends
14	FR-1 fractions - emphasis on 1/2, 1/3, 1/4
15	ME-3 length - inches
16	ME-5 volume - cups, pints, quarts
17	GE-1 shapes
18	ME-8 money - pennies, nickels, dimes

LEVEL C

Order	Concept
1-R	SETS-7 number comparison
2	PI V-1 ones & tens
3	WN-4 0-100, ordering, skip counting
4	PI V-2 ones thru hundreds
5	A/S-4 add, sub., combs. thru 10
6	A/S-5 add, sub., combs. thru 18
7	A/S-6 3 addends
8	ME-2 time - 5 min.
9	WN-5 Roman numerals I-XII
10	PI V-3 ones thru thousands
11	A/S-7 add, without regrouping
12	A/S-8 sub., without regrouping
13	A/S-9 add, regrouping
14	A/S-10 sub., with regrouping
15	WN-6 odd or even, skip counting
16	M/D-1 mult., facts thru 5
17	FR-2 fractions-halves thru fifths
18	ME-4 length - inches, centimeters
19	ME-6 volume - gallons
20-R	GE-1 shapes

LEVEL D

Order	Concept
1-R	A/S-4 add, sub, combs. thru 10
2	PI V-4 ones thru hundred thousands
3	A/S-7, 8 add, sub., without regrouping
4	A/S-9 add with regrouping
5	A/S-10 sub. with regrouping
6	A/S-11 rounding numbers
7	M/D-2 mult. facts thru 9
8	M/D-3 division - single digits
9	M/D-4 mult. single digit multipliers
10	M/D-5 division - 1 digit divisor
11	ME-7 length, perimeter, area, volume
12	GE-2 plane figures
13	GR-1 graphs, points and coordinates
14	FR-3 fractions -halves thru eighths

LEVEL E

Order	Concept
1-R	PI V-4 ones thru hundred thousands
2	PI V-5 ones thru hundred millions
3-R	A/S-7, 8 add, sub., without regrouping
4-R	A/S-9 add with regrouping
5-R	A/S-10 sub. with regrouping
6-R	A/S-11 rounding numbers
7-R	M/D-4 mult. single digit multipliers
8	M/D-6 mult. with regrouping
9	M/D-5 division - 1 digit divisor
10	M/D-7 division multi-digit divisor
11	M/D-8 averages
12	M/D-10 rounding numbers
13	ME-7 length, area, volume, perimeter
14	FR-4 fractions-parts of whole
15	FR-5 fractions comparison
16	FR-6 fractions - improper, mixed numbers
17	FR-A/S-1 fractions - add, sub., like denominators
18	GE-4 circles
19	GE-5 geometric solids
20	GR-1 graphs-points & coordinates

LEVEL F

Order	Concept
1-R	PI V-5 ones thru hundred millions
2	PI V-6 large magnitude, exponents
3	PI V-7 bases 4 & 5
4-R	A/S-9 add - with regrouping
5-R	A/S-10 sub. - with regrouping
6-R	M/D-6 mult. - regrouping
7	WN-7 number history
8-R	M/D-5 division - 1 digit divisor
9-R	M/D-7 division - multi-digit divisor
10-R	M/D-10 rounding numbers
11-R	M/D-8 averages
12	M/D-9 factors, primes, multiples
13	FR-5 fraction comparison
14-R	FR-A/S-1 fractions, add, sub., like denominators
15	FR-A/S-2 fractions - add, sub., unlike denominators
16	FR-A/S-3 fractions - add, sub., mixed numbers
17	FR-M/D-1 fractions - multiplication
18	DE-1 decimals
19	DE-A/S-1 decimals - add and sub.
20	GE-6 angles
21	GE-3 plane figures, congruency, parallel lines
22	GE-7 geometry - area, volume, surface area
23	GR-2 graphing - 4 quadrants
24	ME-9 metric system

LEVEL G

Order	Concept
1-R	PI V-6 large magnitude, exponents
2	PI V-8 bases 6 & 8
3-R	M/D-6 mult., regrouping
4-R	M/D-7 division, multi-digit divisor
5-R	M/D-9 factors, primes, multiples
6-R	GE-6 angles
7	GE-8 triangles
8-R	FR-5 fraction comparison
9-R	FR-A/S-2 fractions - add, sub., unlike denominators
10-R	FR-A/S-3 fractions-add, sub., mixed numbers
11-R	FR-M-D-1 fractions -multiplication
12	FR-M/D-2 fractions-division
13	RA-1 ratio & proportion
14-R	DE-1 decimals
15	DE-2 rounding decimals
16-R	DE-A/S-1 decimals - add and sub.
17	DE-M/D-1 decimals- multiplication
18	DE-M/D-2 decimals-division
19	GE-9 circles - circumference, area
20-R	GE-7 geometry - area, volume, surface area
21-R	GE-5 geometric solids
22	PER-1 percent
23	IN-1 integers-add, sub.
24	GR-3 graphing - 4 quadrants, functions
25	RA-2 ratio, probability
26-R	GE-3 plane figures, congruency, parallel lines

The U-SAIL "Basic Mathematics Foundation" chart gives a short step by step listing of the skills (sometimes called entering behaviors) needed to move from one concept to another. Have this chart or one of your own design always accessible to you and to your students. It is an invaluable reference which will help you avoid placement of students in failure situations and give you a quick reference of what to review if some building blocks are missing.

4. Know the vocabulary of mathematics. Teach vocabulary to students and make listings of vocabulary available. The U-SAIL Math Glossary gives concise definitions to common terms used.

   Have one of these always accessible for you and your students to use. This monograph provides an excellent source of assistance for parents who want to help their children, but are not familiar with mathematics' terminology.

SUMMARY

In order to effectively organize for teaching mathematics, it is important to:

1. Know the structure of the discipline (what general mathematics included).
2. Identify a general sequence (order) for instruction.
3. Know the skill building blocks needed.
4. Know the vocabulary of mathematics.

MANAGEMENT

1. Identify and organize materials to be used for instruction.

   a. Organize a file of materials to be used by concept, add to your file as your program develops.

      Note: If you have a U-SAIL pharmacy, every concept taught is represented by a divider in your file. The dividers by concept and all materials behind them are in the same order they appear on your concept chart.

b. Include in your file:

U-SAIL developed materials.
Materials from other sources.

c. Code all materials filed. This insures immediate accessibility to materials. See your concept chart on page four for a simple code which can be used as a guide. For example: Addition sums through five = A/S-1. It is the first whole number addition and subtraction concept. A/S stands for addition/subtraction and "1" stands for the first concept in that area.

d. Organize a collection of math realia, (concrete objects) which can be used to manipulate. Have these in one designated place. Include realia of different sizes and shapes. Add to this collection as your program grows.

e. Identify textbooks and organize them for ease in accessibility. Have texts on a minimum of three grade levels. The level you are assigned, one above and one below. Ideally you should have a wider spread, but in the beginning, three levels is all that most teachers can effectively manage. The teacher is the ultimate judge of how wide a span to include. The textbooks provide practice materials identified by pages numbered in your U-SAIL materials.

Note: Remember, as a teacher, you are teaching for mastery. That means that you teach concept by concpet or skill by skill. This necessitates not going page by page in a textbook.

f. Identify answer keys and have these organized for immediate, but teacher monitored, accessibility. Students need immediate feedback. In the beginning most teachers check all work with students or by themselves, but as students progress, it is critical that they not have repeated incorrect practice. Accurate, and as immediate as possible, knowledge of results is a vital factor in the effective development of mastery of any skill. Most students learn to check a great deal of their practice work themselves.

Remember, in identifying curriculum resources, keep in mind that materials in mathematics, to be effective, should be multi-graded and include:

1. Assessment -- (pre and post) instruments.

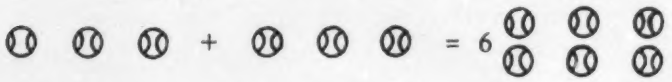
2. Suggested ways to teach each concept.

3. Manipulative activities for practice. Students must grow from a concrete to an abstract base. Each new concept taught should include, when possible, experience with things that can be handled. This helps develop the idea in the student's mind using an activity which he can relate directly to his own experience base. Without this connection, you cannot expect skill in application.

   Note: To be effective it is important to begin with actual objects (manipulative activity).

   3 balls + 3 balls = 6 balls
   using balls themselves

   then transfer to pictorial representations of the actual objects

   next use abstract visual symbols

   | | | + | | | = 6

   and finally work with symbols alone

   3 + 3 = 6

4. Symbolic activities for practice. Symbolic activities provide mathematics practice to build toward mastery and do not necessarily include working with objects.

   3 + 3 = 6

5. Application or center activities for practice. Application or center activities are experiences designed to give students opportunity to use the skill they have learned.

Note: These can be used as review for students who are working on other concepts. They provide a necessary constant link between arithmetic practice and lifes' realities. These can be used as assigned activities or student choice activity for building program breadth and enrichment.

2. Design management visuals (charts, lists, etc.) which will enable you to know precisely where each student is and be able to hold him accountable for his performance.

   a. Include provision for group assignment.

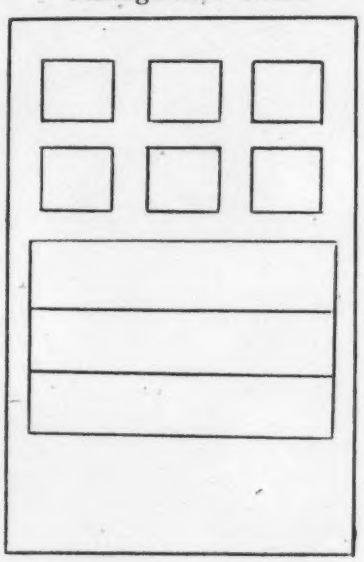
   b. Include provision for center or manipulative activity assignment.

   c. Include space on charts made for activities such as testing, schedules, etc.

      Note: Management visuals should be designed to meet specific needs. Some teachers prefer lists or small notebook size charts; while others use wall charts. The important thing to remember is that each teacher must have an organized way of assigning and reassigning students to participate in specific activities.

An illustration of a management chart is given below.

Management Chart



To prepare the above type chart you need one heavy piece of railboard or cardstock for background and one piece of paper or other material for pleating. Once you've decided on the overall size of the chart you can make, begin with a 33" piece of pleating material and mark your pleating sheet at 7", 10", 17", 20", 27", and 30" on both edges of the edges of the width of the material. Then, for ease in pleating, using a yardstick as a guide, press the material against the edge of the stick forming a straight crease at each of the places marked. Next fold your pleats.

Place the pleated material on the heavy backing and tape the lower and two side edges in place. You may then decorate your chart or leave it as is.

To use your chart -- either write on the chart, use paper clips to attach designated activity labels on it, or put 3" x 5" cards inside the pockets made.

Prepare name tags for every student. Be sure they are sturdy and can be seen above each pocket.

You then simply move cards or clips to change activities.

3. Organize your physical environment to make individualized mathematics instruction possible.

    a. Establish a mathematics' environment. Label what you are doing -- emphasize basic skill development progress by visuals.

    b. Have a place for:

        Curriculum materials to be stored.

        Realia (math materials, counters, cubes, whatever you can collect). (Check material lists given with each skill (concept).)

        A checking station.

        Centers where games, etc. which are limited in number can be used. Avoid collision courses -- high barriers.

Student records, data sheets and work to be stored. (Use of two or three mini-files is suggested.)

Sign-up for help charts, etc.

Independent application activities filed by skill.

c. Arrange your space to insure that you are physically accessible to all students.

d. Establish your total learning area so that it is functional and flexible.

Note: For specific suggestions on how to work with space and centers, see the U-SAIL monographs "Let's Look at Space" and "Center on Centers" for assistance.

4. Design systems for keeping accurate day by day records of what is happening in the classroom.

This necessitates development of both student kept and teacher kept records of student progress being made.

a. The teacher managed system should include a group progress record of concepts to be taught and mastered. Either a large grid or looseleaf notebook is recommended.

(1) With concepts on at least three levels of difficulty identified across the top of the grid or page:

Add names of students.

Mark each concept square as it is mastered with a slash mark or other marking procedure of your choice.

(When using three levels use the concepts in the order they are taught for the level of difficulty of your grade assignment and one level below and one level above. For example: fifth grade assigned plus fourth and sixth grade concepts.)

A model for a teacher kept record follows.

	1-R	2	3-R	4-R	5-R	6-R	7-R	8	9	10	11	12	13	14	
	Pl V-4 ones thru hundred thousands	Pl V-5 ones thru hundred millions	A/S-7, 8 add, sub. without regrouping	A/S-9 add with regrouping	A/S-10 sub. with regrouping	A/S-11 rounding numbers	M/D-4 mult. single digit multipliers	M/D-6 mult. with regrouping	M/D-5 division - 1 digit divisor	M/D-7 division multi- digit divisor	M/D-8 averages	M/D-10 rounding numbers	ME-7 length, area, volume, perimeter	FR-4 fractions - parts of whole	
Cathy Anderson															
Joel Andrews															
Robin Cummings															
Dianne Davis															
Stephen Evans															
Curtis Handly															
Jolene Johnson															
Sherrie Lamb															
Scott Mathews															
Emily Morrison															
Trent Newton															
Bradly North															
Sara Owens															
Robert Paul															
Carol Peterson															
Scott Quist															
Peter Rawlings															

b. Set up a file for keeping track of individual student records.

c. Make an individual file, or folder, or notebook for each student.

(1) Select or design a student record which will provide concrete on-going data of work assigned and completed within a single concept. This will give the structure for all assignments given and student choices made.

Include the following characteristics:

Name of student and date.

What concept a student is working with.

A way to show what the teacher assigns (pages, lexes, etc.).

A way to show what a student chooses for himself to do.

A way to show completion of each activity.

A way to show how a student feels about what he has done.

A way to show when conferencing has occurred.

Two models for student kept records follow:

Name _____ Date _____

Math Idea (Concept) _____

_____

We use the pretest to see what I will do. ☐ ☒ Work I have done.

I learn.

Lex 1	

I practice and apply.

Lex #				
Textbook				
Other				

How I feel about what I did!

How I did! (Pre - Post Test)

Before	After

I talked to the teacher about what I did and how I feel. ☐

My Math Record

Name _____ Date _____

Math Idea (Concept) _____

_____

We use the pretest to see what I will do. ☐

I learn.

Lex 1	

☒ Work I have done.

I practice and apply.

Lex #				

Textbook				

Other				

How I feel about what I did!

How I did! (Pre - Post Test)

Before	After

Very pleased	Satisfied	Unsatisfied

I talked to the teacher about what I did and how I feel. ☐

(2) If student folders are used, staple the first individual student record into each file folder.

(3) As each new concept is introduced a new retrieval sheet is added and stapled on top of the previous one. This gives a complete on-going record of progress being made.

(4) Generally all work completed should be kept in the individual students' folder. This gives proof of completion and explicit back-up data for use in giving specific assistance during each class time or at conference time.

(5) If folders are utilized, place them in small boxes or other receptacles placed strategically around the room for ease in accessibility. (Provide at least two or three boxes for this.)

SUMMARY

Effective management necessitates that each teacher:

1. Identify and organize diagnostic/prescriptive materials to be used for instruction.

2. Design efficient management procedures.

3. Organize an individualized functional and flexible physical environment.

4. Design an on-going system for keeping an accurate record of student progress.

INSTRUCTION

Beginning to teach diagnostically and prescriptively:

1. Assess where learners are in terms of mastery and review with the total group.

   Your challenge is to accomodate individual differences within a group context. You begin with the total group and then gradually sub-divide the group according to achievement; but you never group beyond the number of groups you can effectively teach, manage and monitor. Students must not be left for long periods on their own to work without instruction and assistance.

   Note: Diagnose and prescribe in terms of:

   a. What a learner knows.

   b. How a learner behaves.

   c. How a learner feels.

   Establish an accepting, valuing, and expecting climate for learning.

2. Teach management procedure to the total group. Include how to:

   a. Start with a concept identified in the order for instruction.

   b. Teach new vocabulary (manipulative, concept summary, etc.).

   c. Teach new format (pac, lex, etc.).

   d. Review content and use of space including centers (math realia, checking stations, etc.). Include who goes where, when and under what conditions.

   e. Teach how to use individual retrieval forms.

   f. Review management procedures, charts, etc. which identify concept, group and individual activities.

3. Teach teaching procedures to the total group. Include:

   a. An introduction to concept teaching. Emphasize the need for basic skill mastery.

   b. An introduction to how feedback systems are aides in achieving mastery. Emphasize the need for students and teachers to know where students are, where they have been, and what the next steps include.

      (1) Records to be kept by each student.

      (2) Records to be kept by teacher.

      (3) Sign-up sheets.

      (4) Oral conferencing, planning, teaching, and evaluation schedules, etc.

   c. The teaching of a skill or review a group of skills with the total group.

      (1) Label the purpose of the activity.

      (2) Teach the skill. (Emphasize concrete application.)

      (3) Assign practice activity -- allow differing time for completion of activity.

      (4) Work to insure that the task to be done is clear.

      (5) Check to see that each student has all materials needed for work.

      (6) Check to see that all students know what they should do when their assigned work is completed.

      (7) Monitor work in progress.

      (8) Give assistance with specific problems or provide a way to get assistance.

      (9) Check work completed (either student, student with teacher assistance or teacher may do this). Immediate knowledge of results is essential.

      (10) Have students mark what they have done in their individual records.

4. Organize the group into math groups according to student mastery levels. (How many groups are operational is a teacher decision -- don't go beyond that which you can manage. Usually begin with only two or three. Expand as you and your learners gain expertise.)

   a. Teach one group while the other/s work.

   b. Differentiate instruction within each group as specific learners need more or less assistance or different kinds of practice.

   c. Provide next step instructions for all learners.

   d. Monitor overall progress -- carefully checking all aspects of instruction.

5. Teach student behaviors you expect when each student is:

   a. Working independently with a group.

   b. Keeping retrievals.

   c. Working at centers.

   d. Conferencing with the teacher.

   e. Moving from one task to another.

   f. Using math materials, etc.

6. Provide independent mathematics activities.
   Once program is under way:

   a. Include application experiences for learners into which they can choose.

   b. Include opportunity for students to generate activities of their own.

   c. Include in-life activities which provide enrichment and depth. For example: Build a model of a chair to scale, conduct a consumer study of best bargains using the newspaper.

d. Include computation drill activities which will help build speed and accuracy.

7. Establish student math conferences.

   a. Include small group and individual conferences relative to math progress.

   b. Provide option for both formal teacher designated conference times and student designated conference times.

      Note: Set a goal for yourself in terms of how frequently you can meet with each child. See the U-SAIL monograph "Conferencing Makes the Difference" for assistance.

8. Establish on-going computational drill. This provides excellent activitiy to use for the short periods either as an independent, partner or total group activity.

   a. Establish specific time for short focused drill on computation. This should include work with counting, basic addition, subtraction, multiplication and division facts.

   b. Do not drill without having first taught a concept and keep the time short. "Take 5 for Drill" is a U-SAIL monograph that can help you with this.

   c. Design a record keeping system which gives you precise data about which specific facts students do and do not know. If a chart is used, a model for one follows:

	Skill	Skill	Skill	Skill	Skill	
Name						
Name						
Name						
Name						

d. Work first for accuracy, then speed.

Note: Make all your diagnoses and prescriptions in terms of each student. This will vary in terms of:

(1) Knowledge of math concepts.

(2) Ability to work in different work patterns. (large group, small group, independently)

(3) Ability to be responsible for task completion.

(4) Ability to cope effectively and emotionally with a given situation.

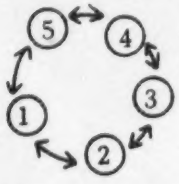
SUMMARY

Effective instruction necessitates an operational environment in which assessment and diagnostic and prescriptive practices are accurate and procedures for working are clear and smoothly running. Students and teachers must be aware of options available and have immediate access to resources needed.

THE PROGRAM REVIEWED

The following procedural model graphically summarizes the steps taken to effectively install an individualized mathematics program. This model can serve as a visual reminder of the essential elements needed.

U-SAIL Procedure Model



1. Use of planning model described. 2. Organization of resources available. 3. Installation of an environment in which individualization is possible. This involves management of resources including: space variables, curriculum products, student data, teacher/student interaction, student independent and interpersonal relationships. 4. Installation of diagnostic/prescriptive teaching. 5. Installation of student directed teaching and learning strategies includes all aspects of learner decision making.

It is possible for every teacher to be a more effective instructor of students in mathematics.

In classroom practice the teacher sets goals and plans programs using the steps in the model. Resources are organized to give him opportunity to work with individuals, small groups or large groups of students. Planning instruction and organizing the physical environment precede actual teaching.

Concrete materials such as counters, money, and blocks are used. Areas where testing is done, and group and individual study areas are identified. Materials are coded for immediate access, e.g. addition: sums through five (A/S-1). A student is tested, a diagnosis is made and the student is taught according to his mastery level. Prescription for each student is accepted as having unique intellectual, social, emotional and physical implications. A humane environment for learning is considered to be critical. The teacher teaches, or provides teaching of the concept to the need's group formed. Options available for practice are itemized on records (retrievals) kept by each student. The teacher monitors, reteaches and conferences with each student as needed. The amount and kind of practice done varies from student to student. Activities are provided which move from concrete to symbolic practice. Immediate knowledge of results is given. A concept test is administered. Then application experiences, in as real-life situations

as possible, are provided. Throughout the experiences, the teacher provides five minute total class drill in computation skills each day. Several instructional groups, plus individual student activity, are operational at a given time. For example, a typical class period could include the teacher teaching a concept to one group of five students, conferencing individually with six, interacting informally with all students, and giving a concept test to six. The system enables teachers to use resources available in increasingly efficient ways as they learn to manage and teach more effectively.

As he reaches each stage, each student is given increased opportunity to self-select, plan, organize, follow-through and evaluate his own work. Movement is in a continuous progress framework from dependence to independence. All system components are always operational and influence the behavior of teachers and learners as they manage, teach, and learn.